REMARKS

Claims 75-99 are pending in this application, with claims 75 and 91 being independent. Claims 91-94 have been amended to correct minor informalities. No new matter has been introduced.

Initially, applicants thank Examiner Tapolcai for the indication that dependent claims 85 and 98 recite allowable subject matter. Applicants also thank Examiner Tapolcai for the courtesies extended to applicants' representative during the telephone interview on January 7, 2008. This reply reflects the substance of the interview.

Claims 75-84, 86-97, and 99 were rejected as being unpatentable over U.S. Patent No. 6,964,177 ("Lee") in view of U.S. Patent No. 7,008,032 ("Chekal"). As discussed in the interview of January 7, 2008, Applicants request reconsideration and withdrawal of this rejection because neither Lee nor Chekal qualify as prior art with respect to independent claims 75 and 91.

Neither Lee nor Chekal qualify as prior art under 35 U.S.C. § 102(e) because neither was filed before applicants' invention of the claimed subject matter. Lee was filed on January 7, 2004 and Chekal was filed August 29, 2003, both of which are before the filing date of the present application. However, the present application claims priority to four applications filed in Korea on March 28, 2003, which is before the January 7, 2004 filing date of Lee and also before the August 29, 2003 filing date of Chekal. The Korean applications, which provide support for the claimed subject matter, are evidence of applicants' invention of the claimed subject matter prior to the filing dates of Lee and Chekal.

In support of this argument, applicants submit herewith (1) a verified translation of Korean Patent Application No. 10-2003-0019726, filed March 28, 2003, (2) a verified translation of Korean Patent Application No. 10-2003-0019727, filed March 28, 2003, (3) a verified translation of Korean Patent Application No. 10-2003-0019732, filed March 28, 2003, and (4) a verified translation of Korean Patent Application No. 10-2003-0019733, filed March 28, 2003. The present application claims priority from each of these Korean applications, and support for at least independent claims 75 and 91 may be found throughout the verified translations. Therefore, applicants submit that provision of the translations of the Korean applications from which the present application claims priority disqualifies both Lee and Chekal as prior art.

Notably, in the Interview Summary from the interview of January 7, 2008, Examiner Tapolcai indicated that:

> "if Applicant sends in a translation of one of the foreign applications on which foreign priority is being claimed, he will obtain the benefit of the March 28, 2003 filing date of that application. This filing date will then predate the January 7, 2004 filing date of the Lee et al patent and remove it as a valid reference."

Accordingly, for at least the above reasons, applicants respectfully request reconsideration and withdrawal of the rejection of independent claims 75 and 91 and their dependent claims.

It is believed that all of the pending issues have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this reply should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

No fees are believed due. Please apply any charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 2/12/2008

Jeremy J. Monaldo
Reg. No. 58,680

Fish & Richardson P.C.
1425 K Street, N.W.
11th Floor
Washington, DC 20005-3500
Telephone: (202) 783-5070
Facsimile: (202) 783-2331

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Il-Shin KIM et al.	Art Unit	: 3744
Serial No.	: 10/549,934	Examiner	: William E. Tapolcai
Filed	: September 20, 2005	Conf. No.	: 7907
Title	: REFRIGERATOR		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPENDIX

- Translation of Korean Patent Application No. 10-2003-0019726, filed March 28, 2003 (16 pages)
- Translation of Korean Patent Application No. 10-2003-0019727, filed March 28, 2003 (14 pages)
- Translation of Korean Patent Application No. 10-2003-0019732, filed March 28, 2003 (18 pages)
- Translation of Korean Patent Application No. 10-2003-0019733, filed March 28, 2003 (21 pages)

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[ABSTRACT]

Disclosed is a refrigerator having a refrigerating compartment 10 formed at an upper portion and a freezing compartment 12 formed at a lower portion. An ice-making chamber 20 is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib. A vaporizer 32 is installed in an ice-making chamber 200. An additional vaporizer 52 is installed in a heat exchanger chamber 50 formed in rear of the freezing compartment 12. A flower fan 54 for directing the cool air generated from the vaporizer to the freezing and refrigerating compartments. Since the refrigerating compartment 10 is designed to be opened and closed by a pair of doors, the cool air leakage can be minimized. The door 6 for opening and closing the freezing compartment is a drawer type door.

[REPRESENTATIVE DRAWING]

FIG. 2

[INDEX WORD]

Refrigerator, Ice-making unit, Dispenser

[SPECIFICATION]

[TITLE OF THE INVENTION]

REFRIGERATOR HAVING ICE MAKER IN REFRIGERATING COMPARTMENT

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a front view of a refrigerator according to an embodiment of the present invention.

Fig. 2 is a front view of a refrigerator according to an embodiment of the present invention, when a door is opened.

Fig. 3 is a sectional view of a refrigerator according to an embodiment of the present invention.

<DESCRIPTION OF THE SYMBOLS IN MAIN PORTIONS OF THE DRAWINGS>

2, 4: Refrigerating compartment door	6: Freezing compartment door
10: Refrigerating compartment	12: Freezing compartment
20: Ice-making chamber	22: Thermal insulation barrier rib
24: Ice-making unit	26: Ice storage unit
32: Vaporizer	34: Blower fan
40: Machine room	42: Compressor
52: Vaporizer	54: Blower fan
60: Barrier	

[DETAILED DESCRIPTION OF THE PRESENT INVENTION]

[OBJECT OF THE PRESENT INVENTION]

[FIELD OF THE INVENTION AND DESCRIPTION OF THE RELATED ART]

The present invention relates to a refrigerator, and more specifically, to a refrigerator having a refrigerating compartment, which is installed at an upper portion, has an ice-making unit installed therein, and uses a pair of doors, thereby providing convenience in use and minimizing leakage of cool air.

Generally, a refrigerator has a freezing compartment formed at an upper portion and a refrigerating compartment formed at a lower portion. In a side-by-side refrigerator, the freezing compartment is formed at a left side and the refrigerating chamber formed at a right side.

Recently, refrigerators having an icemaker for making and storing ice have been on the market. The ice made by the icemaker is stored in an ice storage unit and is dispensed through a dispenser installed on a front portion of a door of the refrigerator when a user wishes to use the ice.

Furthermore, the ice-making unit is generally installed in the freezing compartment where a low temperature capable of making the ice can be maintained. When the ice-making unit is installed in the freezing compartment, A lot of design limitations may occur in accordance with the location of the freezing compartment. For example, in a combination type refrigerator where the freezing compartment is formed at an upper portion and the refrigerating compartment is formed at a lower portion, it is very difficult to install the ice-making unit. Furthermore, it is very inconvenient to dispense the ice through the dispenser from at the front of the refreezing compartment.

When the ice-making unit is installed in the refrigerating compartment, it is difficult to adjust the temperature of the refrigerating compartment or the ice-making capability may be significantly deteriorated.

[TECHNICAL OBJECT OF THE INVENTION]

The present invention has been made in an effort to solve the above-described

problems and it is an object of the present invention to provide a refrigerator that can minimize cool air leakage out of a refrigerating compartment when a door is opened and closed, accurately maintain a temperature of the refrigerating compartment, and has an ice-making unit installed in the refrigerating compartment.

[CONSTITUTION AND OPERATION OF THE INVENTION]

To achieve the above objects and other advantages, the present invention provides a refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator including: an ice-making chamber 20 that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit; a first vaporizer that is installed in the ice-making chamber to reduce a temperature of the ice-making chamber; a second vaporizer that is installed in the freezing compartment to generate cool air supplied to the freezing and refrigerating compartments; and doors for opening and closing the freezing and refrigerating compartments, wherein the refrigerating door for the refrigerating compartment is formed with a pair of doors that are opened and closed with reference to left and right side ends.

The door for the freezing compartment may be a drawer type door.

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown.

Reference will now be made in detail to the embodiments of the present disclosure, example of which are illustrated in the accompanying drawings.

Fig. 1 is a front view of a refrigerator according to an embodiment of the present invention, Fig. 2 is a front view of a refrigerator according to an embodiment of the present invention, when a door is opened, and Fig. 3 is a sectional view of a refrigerator

according to an embodiment of the present invention.

Fig. 1 is a front view of a refrigerator according to an embodiment of the present invention, when a refrigerator door is opened, Fig. 2 is a front view of a refrigerator according to a second embodiment, when a refrigerator door is opened, and Fig. 3 is a sectional view of a refrigerator according to the present invention.

As shown in Figs. 1 and 2, a refrigerator of the present invention has a refrigerating compartment 10 formed at an upper portion and a freezing compartment formed at a lower portion. The refrigerating and freezing compartments 10 and 12 are opened and closed by doors 2 and 4. That is, as shown in Fig. 1, a pair of doors 2 and 4 are installed on hinges (not shown) that are formed upper and lower portions of respective both side ends and opened leftward and rightward with reference to left and right ends, respectively.

When the pair of the doors 2 and 4 are provided to open and close the refrigerating compartment 10, the following advantages can be obtained. In response to tendency of large capacity refrigerators, the internal volume of the refrigerating compartment has been increased. Further, since an ice-making chamber 20 (see Figs. 2 and 3) must be installed in the refrigerating compartment 10 according to the present invention, it is preferable that the refrigerating compartment 10 is designed to have a large capacity to obtain a sufficient refrigerating space. When the refrigerating compartment is large-sized s described above, it is preferable to install a pair of doors 2 and 4. That is, the cool air leaks out of the refrigerating compartment when the door is opened and closed. Therefore, when only one door is installed, the cool air leakage increases. When the pair of doors 2 and 4 are provided, the cool air leakage can be

relatively minimized by opening and closing only one of the doors 2 and 4. Additionally, a sufficient space in front of the refrigerator must be provided to open and close the door. When only one large-sized door is provided, the space in front of the refrigerant must increase and it is inconvenient to open and close the large-sized door. Accordingly, when the pair of doors 2 and 4 are provided to be opened and closed leftward and rightward with reference to the both side ends, respectively, it is more convenient to open and close the door and the space in front of the refrigerator can be more efficiently used.

The freezing compartment 12 installed at the lower portion of the refrigerator can be opened and closed by doors. At this point, the freezing compartment 12 may be opened and closed by, for example, drawer type doors. In this case, the door is pulled frontward to be opened. In this state, the user can easily find desired foodstuff.

Handles 2a, 4a, and 6a are installed on respective front portions of the doors 2, 4, and 6. The user graphs the handle to open and close the corresponding door.

As shown in Fig. 3, the ice-making chamber 20 is formed at a side of an upper portion of the refrigerating compartment 10. Since the ice-making chamber 20 must maintain a low temperature that is significantly lower than a temperature of the refrigerating compartment 10, the ice-making chamber 20 is isolated by a thermal insulation barrier rib 22. The thermal insulation barrier rib 22 is designed to entirely enclose the ice-making chamber 22 and thermal insulation material such as polyurethane or foam is filled in the thermal insulation barrier rib 22. That is, the thermal insulation barrier rib 22 is designed to sufficiently insulate the ice-making chamber 20 from the refrigerating compartment 10.

A separated vaporizer 32 is installed in the freezing compartment 20. The vaporizer 32 is configured to reduce a temperature of the ice-making chamber 20 to a level that can make ice by heat-exchanging with ambient air by refrigerant that is reduced in a temperature and pressure by a compressor 42 and a condenser (not shown).

A blower fan 34 that can uniformly transfer the cooled air generated by contacting the vaporizer 32 into the ice-making chamber 20. The vaporizer 32 is not limited to a specific type. Any types of the vaporizer can be used as far as they can generate low temperature air through a heat exchange with ambient air. For example, the blower fan 34 may be omitted and a vaporizer to which a direct cooling method can be applied may be used.

An ice-making unit 24 that can make ice using the cool air generated by the vaporizer 32 is installed in the ice-making chamber 20. Any types of the ice-making unit, which can make the water stored in a tray frozen, may be used.

An ice storage unit 26 is installed under the ice-making unit 24. The Ice storage unit 26 is provided to store the ice made by the ice-making unit 24. The transfer of the ice made in the ice-making unit to the ice storage unit 26 may be automatically or manually realized by the well-known prior arts. For use convenience, an automatic icemaker that can automatically transfer the ice made in the ice-making unit to the ice storage unit may be used.

An ice conveying unit (e.g., a screw-type wire that can convey the ice by rotating) for directing the ice stored in the ice storage unit 26 to an external side is installed in the ice storage unit 26. That is, the ice conveying unit is designed to rotate and convey the

ice to an ice guide duct 36 communicating with the ice storage unit 26. The dispenser is installed on the front portion of the refrigerating compartment door 4 and the ice stored in the ice storage unit 26 is directed toward the dispenser 6 along the ice guide duct 36 by the ice conveying unit such as the screw-type wire.

In order to connecting an outer end of the ice guide duct 36 to the dispenser 6, it is formed on the refrigerating door 4. An inner end of the ice guide duct 36 is connected to the ice storage unit 26 via the thermal insulation barrier rib 22 of the ice-making chamber 20.

An Ice dispensing control unit for controlling the dispensing of the ice by selectively opening the ice guide duct 36 may be installed on the dispenser 6 installed on the front portion of the refrigerating compartment door 4. For example, the ice dispensing control unit 6 includes an operation lever installed at an outer side of the dispenser 6, a baffle for opening/closing the ice guide duce 36 In response to a user's manipulatlon of the operation lever. Any well-known structures may be used as the ice dispensing control unit.

A heat exchange chamber 50 is formed on an inner-rear portion of the freezing compartment 12. A vaporizer 52 and a blower fan 54 are installed in the heat exchange chamber 50. The vaporizer 52 generates cool air using low temperature/pressure liquid refrigerant supplied by a compressor 42 and a condenser (not shown). A part of the cool air generated around the vaporizer 52 is directly supplied to the freezing compartment 12 by the flower fan 54 and the rest is supplied to the refrigerating compartment through a cool air supply duct 56 connected to the refrigerating compartment 10 via a rear portion of a barrier 60.

The cool air supplied to the refrigerating compartment through the above-described path circulates the inside of the refrigerating compartment. Air that is increased in a temperature by heat-exchanging with the food stuffs stored in the refrigerating compartment is returned into the heat exchange chamber 50 through a recovery duct 58 installed on a rear wall of the barrier 60 or a rear side of the barrier 60. The supply of the cool air to the refrigerating compartment 10 is realized through the above-described path and the cool air circulation along this path is repeated.

That is, a part of the cool air generated by the vaporizer installed in the heat exchange chamber 50 is directly supplied into the freezing chamber 12 by the blower fan 54 and the rest is supplied to the refrigerating compartment 10 through the cool air supply duct 56, thereby maintaining the refrigerating and freezing compartments 12 and 10 at a predetermine low temperature state.

According to the present invention, the refrigerating compartment 10 is designed to be opened and closed by the pair of doors 2 and 4 and the ice-making chamber 20 is formed in the refrigerating compartment 10. Additionally, the cool air supply is controlled by installing different vaporizers in the ice-making chamber 20 and the freezing compartment 12, respectively.

In the present invention, it can be noted that the ice-making chamber 20 is an independent space separated by the thermal insulation barrier rib 22. Therefore, various modifications of the thermal insulation barrier rib 22 may be possible as far as the modifications can form a separated, independent ice-making chamber in the refrigerating compartment.

Furthermore, it may be considered that the ice-making chamber 20 is separately

prepared and detachably installed in the refrigerating compartment. That is, a box-shaped ice-making chamber may be made by a thermal insulation barrier rib and the chamber is detachably installed in the refrigerating compartment. In this case, the internal space of the refrigerating compartment 10 can be more efficiently utilized. In addition, when the ice-making chamber 20 is detachably installed, the ice-making unit and the vaporizer may be integrated with the ice-making chamber, and if required, the ice-making chamber 20 may be assembled in an assembling line.

This invention has been described above with reference to the aforementioned embodiments. It is evident, however, that many alternative modifications and variations will be apparent to those having skill in the art in light of the foregoing description. Accordingly, the present invention embraces all such alternative modifications and variations as fall within the spirit and scope of the appended claims.

[EFFECT OF THE INVENTION]

As described previously, a pair of doors are provided to open and close the refrigerating compartment 10 in which the ice-making chamber is installed. By providing the pair of doors, the cool air leakage caused by opening and closing the refrigerating compartment can be minimized. Furthermore, in the refrigerator of the present invention, even when the ice-making chamber is provided in the refrigerating compartment formed at the upper portion, the temperature of the freezing compartment does not affect the refrigerating compartment. Since the temperatures of the freezing compartment and the ice-making chamber are controlled by different vaporizers, the ice-making capability can be maximized and, at the same time, power consumption can be reduced.

WHAT IS CLAIMED IS:

1. A refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator comprising:

an ice-making chamber 20 that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit;

a first vaporizer that is installed in the ice-making chamber to reduce a temperature of the ice-making chamber;

a second vaporizer that is installed in the freezing compartment to generate cool air supplied to the freezing and refrigerating compartments; and

doors for openlng and closing the freezing and refrigerating compartments,

wherein the refrigerating door for the refrigerating compartment is formed with a pair of doors that are opened and closed with reference to left and right side ends.

2. The refrigerator according to claim 1, wherein the door for the freezing compartment is a drawer type door.

3. The refrigerator according to one of claims 1 and 2, further comprising:

a dispenser installed on a front portion of the door for opening and closing the refrigerating compartment;

an ice guide duct for guiding the ice from the ice-making chamber to the dispenser; and

an ice dispensing control unit for controlling dispensing of the ice through the ice guide duct.

4. The refrigerator according to one of claims 1 and 2, wherein the second

vaporizer is installed in a heat exchange chamber disposed at a rear of the freezing compartment, the heat exchanger chamber is connected to the refrigerating compartment via a cool air supply duct, and the cool air is directed to the refrigerating compartment by a blower fan installed in the heat exchange chamber.

5. The refrigerator according to claim 4, wherein the cool air supply duct is installed in rear of a barrier separating the refrigerating compartment from the freezing compartment.

6. The refrigerator according to claim 4, further comprising a recovery duct along which air circulating the refrigerating compartment is returned to the heat exchange chamber and which is installed at a rear side of the barrier separating the refrigerating compartment from the freezing compartment.

Fig.1

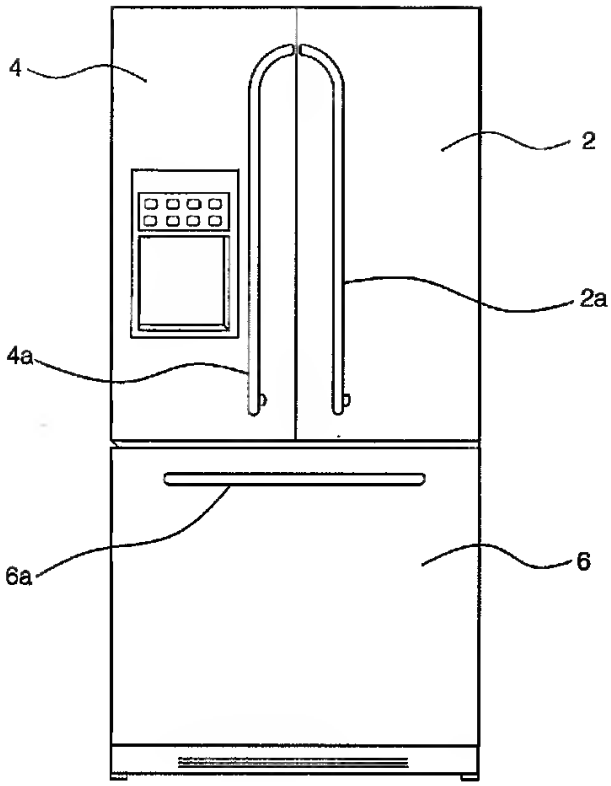


Fig.2

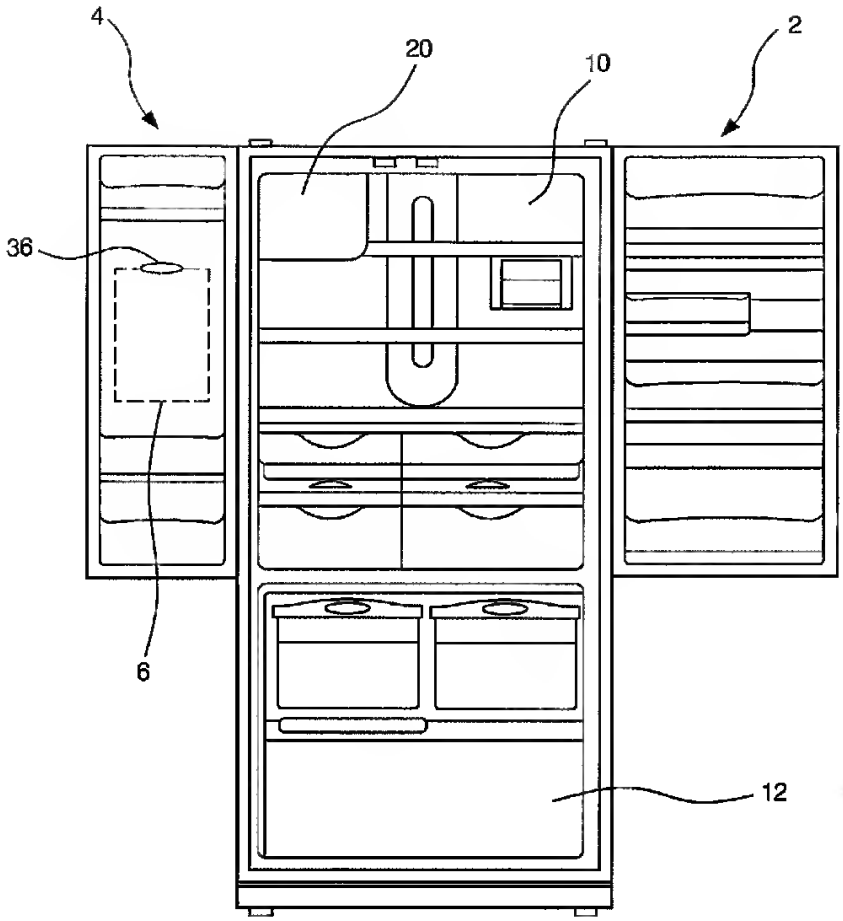
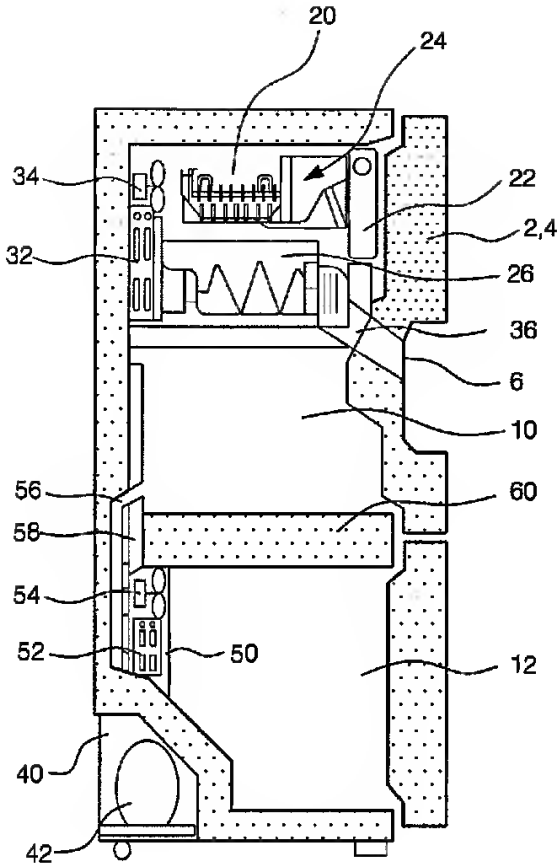


Fig.3



[ABSTRACT]

Disclosed is a refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion. An ice-making chamber 20 is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib 22. A vaporizer 32 is installed in an ice-making chamber 200. An additional vaporizer 52 is installed in a heat exchanger chamber 50 formed in rear of the freezing compartment 12. A flower fan 54 for directing the cool air generated from the vaporizer to the freezing and refrigerating compartments.

[REPRESENTATIVE DRAWING]

FIG. 2

[INDEX WORD]

Refrigerator, Ice-making unit, Dispenser

[SPECIFICATION]

[TITLE OF THE INVENTION]

REFRIGERATOR HAVING ICE MAKER IN REFRIGERATING COMPARTMENT

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a front view of a refrigerator according to an embodiment of the present invention.

Fig. 2 is a sectional view of a refrigerator according to an embodiment of the present invention.

<DESCRIPTION OF THE SYMBOLS IN MAIN PORTIONS OF THE DRAWINGS>

10: Refrigerating compartment
12: Freezing compartment
20: Ice-making chamber
22: Thermal insulation barrier rib
24: Ice-making unit
26: Ice storage unit
32: Vaporizer
34: Blower fan
40: Machine room
42: Compressor
52: Vaporizer
54: Blower fan
60: Barrier

[DETAILED DESCRIPTION OF THE PRESENT INVENTION]

[OBJECT OF THE PRESENT INVENTION]

[FIELD OF THE INVENTION AND DESCRIPTION OF THE RELATED ART]

The present invention relates to a refrigerator, and more specifically, to a refrigerator having a refrigerating compartment formed at an upper portion and a

freezing compartment formed at a lower portion for user convenience.

Generally, a refrigerator has a freezing compartment formed at an upper portion and a refrigerating compartment formed at a lower portion. In a side-by-side refrigerator, the freezing compartment is formed at a left side and the refrigerating chamber formed at a right side.

Recently, refrigerators having an icemaker for making and storing ice have been on the market. The ice made by the icemaker is stored in an ice storage unit and is dispensed through a dispenser installed on a front portion of a door of the refrigerator when a user wishes to use the ice.

The ice-making unit is generally installed in the freezing compartment where a low temperature capable of making the ice can be maintained. When the ice-making unit is installed in the freezing compartment, A lot of design limitations may occur in accordance with the location of the freezing compartment. For example, in a combination type refrigerator where the freezing compartment is formed at an upper portion and the refrigerating compartment is formed at a lower portion, it is very difficult to install the ice-making unit. Furthermore, it is very inconvenient to dispense the ice through the dispenser from at the front of the refreezing compartment.

When the ice-making unit is installed in the refrigerating compartment, it is difficult to adjust the temperature of the refrigerating compartment or the ice-making capability may be significantly deteriorated.

[TECHNICAL OBJECT OF THE INVENTION]

The present invention has been made in an effort to solve the above-described problems and it is an object of the present invention to provide a refrigerator having a refrigerating compartment in which an ice-making unit is installed to accurately maintain a temperature of the refrigerating compartment and provide user convenience.

[CONSTITUTION AND OPERATION OF THE INVENTION]

To achieve the above objects and other advantages, the present invention provides a refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator including: an ice-making chamber 20 that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit; a first vaporizer that is installed in the ice-making chamber to reduce a temperature of the ice-making chamber; and a second vaporizer that is installed in the freezing compartment to generate cool air supplied to the freezing and refrigerating compartments.

In one embodiment, the refrigerator may further include a dispenser installed on a front portion of the door for opening and closing the refrigerating compartment; an ice guide duct for guiding the ice from the ice-making chamber to the dispenser; and an ice dispensing control unit for controlling dispensing of the ice through the ice guide duct.

The second vaporizer is installed in a heat exchange chamber disposed at a rear of the freezing compartment, the heat exchanger chamber is connected to the refrigerating compartment via a cool air supply duct, and the cool air is directed to the refrigerating compartment by a blower fan installed in the heat exchange chamber.

The cool air supply duct is installed in rear of a barrier separating the refrigerating compartment from the freezing compartment.

The refrigerator further includes a recovery duct along which air circulating the refrigerating compartment is returned to the heat exchange chamber and which is installed at a rear side of the barrier separating the refrigerating compartment from the freezing compartment.

Reference will now be made in detail to the embodiments of the present disclosure, example of which are illustrated in the accompanying drawings.

As shown in Figs. 1 and 2, a refrigerator of the present invention has a

refrigerating compartment 10 formed at an upper portion and a freezing compartment formed at a lower portion. The refrigerating and freezing compartments 10 and 12 are opened and closed by a pair of doors 2 and 4.

The freezing compartment 12 installed at the lower portion of the refrigerator can be opened and closed by doors. At this point, the freezing compartment 12 may be opened and closed by, for example, drawer box type doors.

According to the present invention, an ice-making chamber 20 is formed at a side of an upper portion of the refrigerating compartment 10. Since the ice-making chamber 20 must maintain a low temperature that is significantly lower than a temperature of the refrigerating compartment 10, the ice-making chamber 20 is isolated by a thermal insulation barrier rib 22. The thermal insulation barrier rib 22 is designed to entirely enclose the ice-making chamber 22 and thermal insulation material such as polyurethane or foam is filled in the thermal insulation barrier rib 22. That is, the thermal insulation barrier rib 22 is designed to sufficiently insulate the ice-making chamber 20 from the refrigerating compartment 10.

A separated vaporizer 32 is installed in the freezing compartment 20. The vaporizer 32 is configured to reduce a temperature of the ice-making chamber 20 to a level that can make ice by heat-exchanging with ambient air by refrigerant that is reduced in a temperature and pressure by a compressor 42 and a condenser (not shown).

A blower fan 34 that can uniformly transfer the cooled air generated by contacting the vaporizer 32 into the ice-making chamber 20. The vaporizer 32 is not limited to a specific type. Any types of the vaporizer can be used as far as they can generate low

temperature air through a heat exchange with ambient air. For example, the blower fan 34 may be omitted and a vaporizer to which a direct cooling method can be applied may be used.

An ice-making unit 24 that can make ice using the cool air generated by the vaporizer 32 is installed in the ice-making chamber 20. Any types of the ice-making unit, which can make the water stored in a tray frozen, may be used.

An ice storage unit 26 is installed under the ice-making unit 24. The ice storage unit 26 is provided to store the ice made by the ice-making unit 24. The transfer of the ice made in the ice-making unit to the ice storage unit 26 may be automatically or manually realized by the well-known prior arts. For use convenience, an automatic icemaker that can automatically transfer the ice made in the ice-making unit to the ice storage unit may be used.

An ice conveying unit (e.g., a screw-type wire that can convey the ice by rotating) for directing the ice stored in the ice storage unit 26 to an external side is installed in the ice storage unit 26. That is, the ice conveying unit is designed to rotate and convey the ice to an ice guide duct 36 communicating with the ice storage unit 26. The dispenser is installed on the front portion of the refrigerating compartment door 4 and the ice stored in the ice storage unit 26 is directed toward the dispenser 6 along the ice guide duct 36 by the ice conveying unit such as the screw-type wire.

In order to connecting an outer end of the ice guide duct 36 to the dispenser 6, it is formed on the refrigerating door 4. An inner end of the ice guide duct 36 is connected to the ice storage unit 26 via the thermal insulation barrier rib 22 of the ice-making chamber 20.

An ice dispensing control unit for controlling the dispensing of the ice by selectively opening the ice guide duct 36 may be installed on the dispenser 6 installed on the front portion of the refrigerating compartment door 4. For example, the ice dispensing control unit 6 includes an operation lever installed at an outer side of the dispenser 6, a baffle for opening/closing the ice guide duce 36 in response to a user's manipulation of the operation lever. Any well-known structures may be used as the ice dispensing control unit.

A heat exchange chamber 50 is formed on an inner-rear portion of the freezing compartment 12. A vaporizer 52 and a blower fan 54 are installed in the heat exchange chamber 50. The vaporizer 52 generates cool air using low temperature/pressure liquid refrigerant supplied by a compressor 42 and a condenser (not shown). A part of the cool air generated around the vaporizer 52 is directly supplied to the freezing compartment 12 by the flower fan 54 and the rest is supplied to the refrigerating compartment through a cool air supply duct 56 connected to the refrigerating compartment 10 via a rear portion of a barrier 60.

The cool air supplied to the refrigerating compartment through the above-described path circulates the inside of the refrigerating compartment. Air that is increased in a temperature by heat-exchanging with the food stuffs stored in the refrigerating compartment is returned into the heat exchange chamber 50 through a recovery duct 58 installed on a rear wall of the barrier 60 or a rear side of the barrier 60. The supply of the cool air to the refrigerating compartment 10 is realized through the above-described path and the cool air circulation along this path is repeated.

That is, a part of the cool air generated by the vaporizer installed in the heat

exchange chamber 50 is directly supplied into the freezing chamber 12 by the blower fan 54 and the rest is supplied to the refrigerating compartment 10 through the cool air supply duct 56, thereby maintaining the refrigerating and freezing compartments 12 and 10 at a predetermine low temperature state.

According to the present invention, the refrigerating compartment 10 is designed to be opened and closed by the pair of doors 2 and 4 and the ice-making chamber 20 is formed in the refrigerating compartment 10. Additionally, the cool air supply is controlled by installing different vaporizers in the ice-making chamber 20 and the freezing compartment 12, respectively.

In the present invention, it can be noted that the ice-making chamber 20 is an independent space separated by the thermal insulation barrier rib 22. Therefore, various modifications of the thermal insulation barrier rib 22 may be possible as far as the modifications can form a separated, independent ice-making chamber in the refrigerating compartment.

Furthermore, it may be considered that the ice-making chamber 20 is separately prepared and detachably installed in the refrigerating compartment. That is, a box-shaped ice-making chamber may be made by a thermal insulation barrier rib and the chamber is detachably installed in the refrigerating compartment. In this case, the internal space of the refrigerating compartment 10 can be more efficiently utilized. In addition, when the ice-making chamber 20 is detachably installed, the ice-making unit and the vaporizer may be Integrated with the ice-making chamber, and if required, the ice-making chamber 20 may be assembled in an assembling line.

This invention has been described above with reference to the aforementioned embodiments. It is evident, however, that many alternative modifications and variations will be apparent to those having skill in the art in light of the foregoing

description. Accordingly, the present invention embraces all such alternative modifications and variations as fall within the spirit and scope of the appended claims.

[EFFECT OF THE INVENTION]

As described previously, in the refrigerator of the present invention, even when the ice-making chamber is provided in the refrigerating compartment formed at the upper portion, the temperature of the freezing compartment does not affect the refrigerating compartment. Since the temperatures of the freezing compartment and the ice-making chamber are controlled by different vaporizers, the ice-making capability can be maximized and, at the same time, power consumption can be reduced.

WHAT IS CLAIMED IS:

1. A refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator comprising:

an ice-making chamber 20 that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit;

a first vaporizer that is installed in the ice-making chamber to reduce a temperature of the ice-making chamber; and

a second vaporizer that is installed in the freezing compartment to generate cool air supplied to the freezing and refrigerating compartments.

2. The refrigerator according to claim 1, further comprising:

a dispenser installed on a front portion of the door for opening and closing the refrigerating compartment;

an ice guide duct for guiding the ice from the ice-making chamber to the dispenser; and

an ice dispensing control unit for controlling dispensing of the ice through the ice guide duct.

3. The refrigerator according to one of claims 1 and 2, wherein the second vaporizer is installed in a heat exchange chamber disposed at a rear of the freezing compartment, the heat exchanger chamber is connected to the refrigerating compartment via a cool air supply duct, and the cool air is directed to the refrigerating compartment by a blower fan installed in the heat exchange chamber.

4. The refrigerator according to claim 3, wherein the cool air supply duct is

installed in rear of a barrier separating the refrigerating compartment from the freezing compartment.

5. The refrigerator according to claim 3, further comprising a recovery duct along which air circulating the refrigerating compartment is returned to the heat exchange chamber and which is installed at a rear side of the barrier separating the refrigerating compartment from the freezing compartment.

6. A refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator comprising:

an ice-making chamber 20 that is detachably Installed in the refrigerating compartment, provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib, and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit;

a first vaporizer that is installed in the ice-making chamber to reduce a temperature of the ice-making chamber; and

a second vaporizer that is installed in the freezing compartment to generate cool air supplied to the freezing and refrigerating compartments.

Fig.1

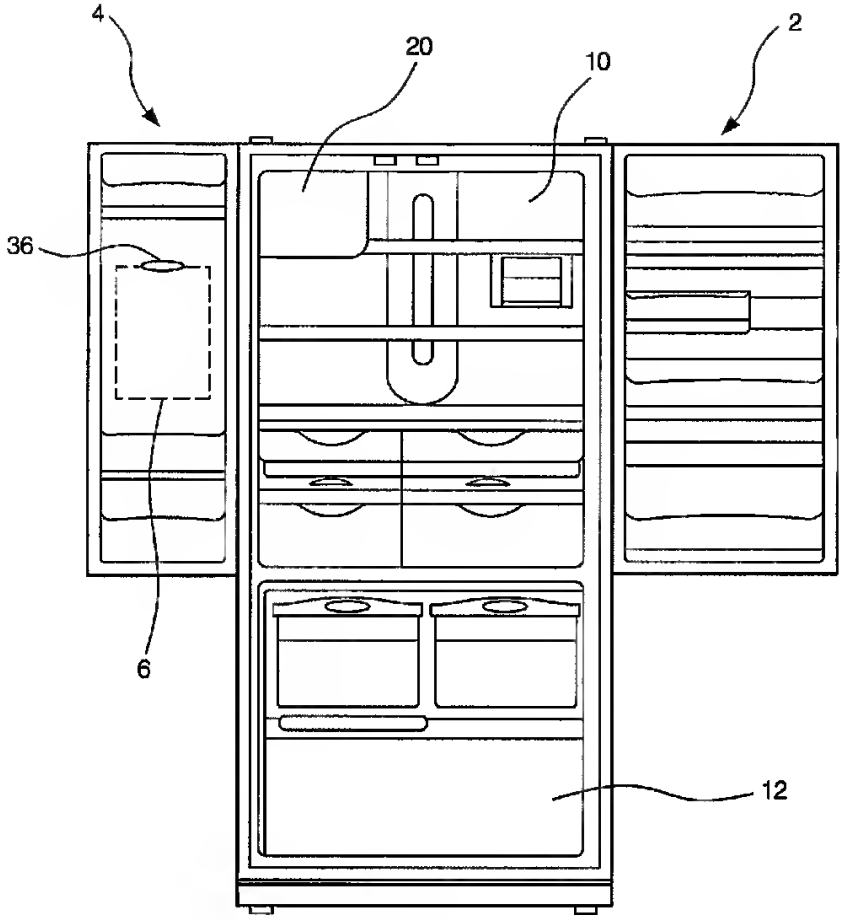
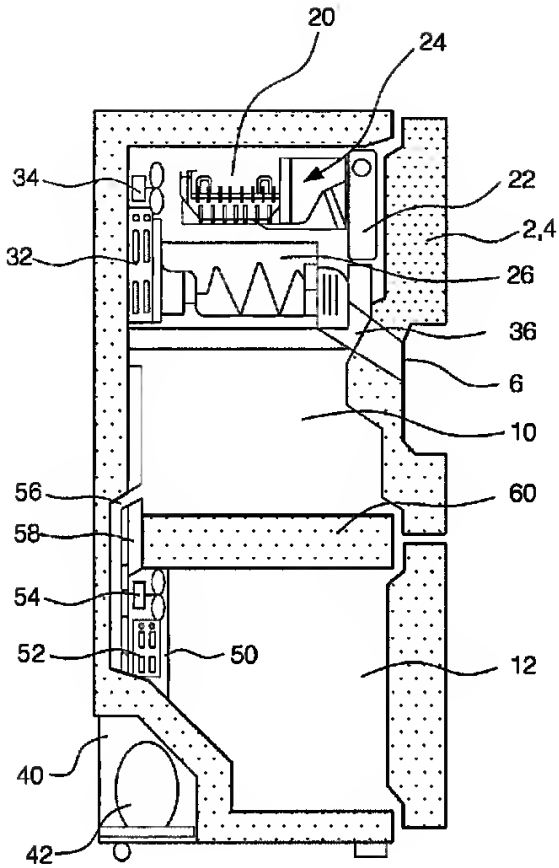


Fig.2



[ABSTRACT]

Disclosed is a refrigerator having a refrigerating compartment 10 formed at an upper portion and a freezing compartment 12 formed at a lower portion. An ice-making chamber 20 is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib. A vaporizer 32 is installed in an ice-making chamber 200. An additional vaporizer 52 is installed in a heat exchanger chamber 50 formed in rear of the freezing compartment 12. A flower fan 54 for directing the cool air generated from the vaporizer to the freezing and refrigerating compartments. Since the refrigerating compartment 10 is designed to be opened and closed by a pair of doors, the cool air leakage can be minimized. The pair of doors have different widths and the door for opening and closing the freezing compartment is a drawer box type door.

[REPRESENTATIVE DRAWING]

FIG. 2

[INDEX WORD]

Refrigerator, Ice-making unit, Dispenser

[SPECIFICATION]

[TITLE OF THE INVENTION]

REFRIGERATOR HAVING FRENCH DOOR

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a front view of a refrigerator according to an embodiment of the present invention.

Fig. 2 is a front view of a refrigerator according to an embodiment of the present invention, when a door is opened.

Fig. 3 is a sectional view of a refrigerator according to an embodiment of the present invention.

<DESCRIPTION OF THE SYMBOLS IN MAIN PORTIONS OF THE DRAWINGS>

2, 4: Refrigerating compartment door
6: Freezing compartment door
10: Refrigerating compartment
10a and 10b: Shelves
12: Freezing compartment
14a, 14b: Drawer boxes
20: Ice-making chamber
22: Thermal insulation barrier rib
24: Ice-making unit
26: Ice storage unit
32: Vaporizer
34: Blower fan
40: Machine room
42: Compressor
52: Vaporizer
54: Blower fan
60: Barrier

[DETAILED DESCRIPTION OF THE PRESENT INVENTION]

[OBJECT OF THE PRESENT INVENTION]

[FIELD OF THE INVENTION AND DESCRIPTION OF THE RELATED ART]

The present invention relates to a refrigerator, and more specifically, to a refrigerator having a refrigerating compartment, which is installed at an upper portion, has an ice-making unit installed therein, and uses a pair of doors having different widths, thereby providing convenience in use and minimizing leakage of cool air.

Generally, a refrigerator has a freezing compartment formed at an upper portion and a refrigerating compartment formed at a lower portion. In a side-by-side refrigerator, the freezing compartment is formed at a left side and the refrigerating chamber formed at a right side.

Recently, refrigerators having an icemaker for making and storing ice have been on the market. The ice made by the icemaker is stored in an ice storage unit and is dispensed through a dispenser installed on a front portion of a door of the refrigerator when a user wishes to use the ice.

The ice-making unit is generally installed in the freezing compartment where a low temperature capable of making the ice can be maintained. When the ice-making unit is installed in the freezing compartment, A lot of design limitations may occur In accordance with the location of the freezing compartment. For example, in a combination type refrigerator where the freezing compartment is formed at an upper portion and the refrigerating compartment is formed at a lower portion, it is very difficult to install the ice-making unit. Furthermore, it is very inconvenient to dispense the ice through the dispenser from at the front of the refreezing compartment.

When the ice-making unit is installed in the refrigerating compartment, it is difficult to adjust the temperature of the refrigerating compartment or the ice-making capability may be significantly deteriorated.

[TECHNICAL OBJECT OF THE INVENTION]

The present invention has been made in an effort to solve the above-described problems and it is an object of the present invention to provide a refrigerator that can minimize cool air leakage out of a refrigerating compartment when a door is opened and closed and has an ice-making unit installed in the refrigerating compartment for user convenience.

[CONSTITUTION AND OPERATION OF THE INVENTION]

To achieve the above objects and other advantages, the present invention provides a French door type refrigerator having a refrigerating compartment for storing foodstuff at a refrigerating temperature and a freezing compartment for storing foodstuff at a freezing temperature, the refrigerator including; a pair of doors for opening and closing the refrigerating compartment, wherein a width of at least one of the doors is greater than a width of a food storage unit installed in the refrigerating compartment so that the food storage unit can be taken out of the refrigerating compartment in a state where only one door is opened.

An ice-making chamber that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and a vaporizer is installed in the ice-making chamber.

Gaskets are installed on opposing surfaces of the pair of doors so that they can contact each other in a state where the doors are closed.

The French door type refrigerator further includes a dispenser installed on a front portion of the door for opening and closing the refrigerating compartment; an ice guide duct for guiding the ice from the ice-making chamber to the dispenser; and an ice dispensing control unit for controlling dispensing of the ice through the ice guide duct.

The refrigerating compartment is formed at an upper portion and the freezing compartment is formed at a lower portion.

A vaporizer for supplying cool air to the freezing and refrigerating compartments is installed in a heat exchange chamber disposed at a rear side of the freezing

compartment, the heat exchange chamber communicates with the refrigerating compartment through the air guide duct, and the cool air is directed to the refrigerating compartment by a blower fan disposed in the heat exchange chamber.

The cool air supply duct is installed in rear of a barrier separating the refrigerating compartment from the freezing compartment.

The refrigerator further includes a recovery duct along which air circulating the refrigerating compartment is returned to the heat exchange chamber and which is installed at a rear side of the barrier separating the refrigerating compartment from the freezing compartment.

Reference will now be made in detail to the embodiments of the present disclosure, example of which are illustrated in the accompanying drawings.

Fig. 1 is a front view of a refrigerator according to an embodiment of the present invention, Fig. 2 is a front view of a refrigerator according to an embodiment of the present invention, when a door is opened, and Fig. 3 is a sectional view of a refrigerator according to an embodiment of the present invention.

As shown in Figs. 1 and 2, a refrigerator of the present invention has a refrigerating compartment 10 formed at an upper portion and a freezing compartment formed at a lower portion. The refrigerating and freezing compartments 10 and 12 are opened and closed by doors 2 and 4. That is, as shown in Fig. 1, a pair of doors 2 and 4 are installed on hinges (not shown) that are formed upper and lower portions of respective both side ends and opened leftward and rightward with reference to left and right ends, respectively.

When the pair of the doors 2 and 4 are provided to open and close the refrigerating compartment 10, the following advantages can be obtained. In response

to tendency of large capacity refrigerators, the internal volume of the refrigerating compartment has been increased. Further, since an ice-making chamber 20 (see Figs. 2 and 3) must be installed in the refrigerating compartment 10 according to the present invention, it is preferable that the refrigerating compartment 10 is designed to have a large capacity to obtain a sufficient refrigerating space. When the refrigerating compartment is large-sized s described above, it is preferable to install a pair of doors 2 and 4. That is, the cool air leaks out of the refrigerating compartment when the door is opened and closed. Therefore, when only one door is installed, the cool air leakage increases. When the pair of doors 2 and 4 are provided, the cool air leakage can be relatively minimized by opening and closing only one of the doors 2 and 4. Additionally, a sufficient space in front of the refrigerator must be provided to open and close the door. When only one large-sized door is provided, the space in front of the refrigerant must increase and it is inconvenient to open and close the large-sized door. Accordingly, when the pair of doors 2 and 4 are provided to be opened and closed leftward and rightward with reference to the both side ends, respectively, it is more convenient to open and close the door and the space in front of the refrigerator can be more efficiently used.

According to the present invention, a width of the door (left door in the drawing) 4 is less than that of the door (right door in the drawing). A plurality of shelves 10a and 10b for supporting foodstuff are installed in the refrigerating compartment 10. A plurality of drawer boxes 14a and 14b are installed at a lower portion of the refrigerating compartment 10. The drawer boxes 14a and 14b may be used as vegetable chambers for freshly storing fruits, vegetables, meats, and/or cheese. The drawer boxes 14a and

14b are opened by being pulled frontward and the user puts the foodstuff into the drawer boxes 14a and 14b through opened tops.

In the drawings, the drawer boxes are provided with two stories in a vertical direction and two drawer boxes are disposed at each story. However, in one embodiment, at least a pair of drawer boxes 14a and 14b are arranged horizontally. In addition, there is no limitation in the number of the stories of the drawer boxes.

According to the present invention, the drawer boxes 14a and 14b are designed to have widths corresponding to those of the corresponding doors 2 and 4. For example, the left drawer box 14a has a width corresponding to a width of the left door 4 and the right drawer box 14b has a width corresponding to a width of the right door 2. Therefore, when the right door 2 is opened, the right drawer box 14b can be taken out from the refrigerating compartment 10. When the left door 4 is opened, the left drawer box 14a can be taken out from the refrigerating compartment 10.

By the above-described structure, when the user intends to take the right drawer box 14b out, the user opens only the right door 2. When the user intends to take the left drawer box 14b out, the user opens only the left door 4. Therefore, when the user takes the drawer box out, the cool air leakage from the refrigerating compartment can be minimized.

Gaskets Ga and Bb may be installed on opposing surfaces of the doors 2 and 4 closed. That is, in a state where the refrigerating compartment is completely closed by the doors 2 and 4, the gaskets Ga and Gb are installed on the opposing surfaces of the doors (i.e., outer surfaces when the doors are opened) to closely contact each other, thereby further preventing the cool air leakage to an external side. The gaskets Ga

and Gb are designed to have a height greater than a height of the refrigerating compartment.

The freezing compartment 12 installed at the lower portion of the refrigerator can be opened and closed by doors. At this point, the freezing compartment 12 may be opened and closed by, for example, drawer box type doors. In this case, the door is pulled frontward to be opened. In this state, the user can easily find desired foodstuff.

Handles 2a, 4a, and 6a are installed on respective front portions of the doors 2, 4, and 6. The user graphs the handle to open and close the corresponding door.

As shown in Fig. 3, the ice-making chamber 20 is formed at a side of an upper portion of the refrigerating compartment 10. Since the ice-making chamber 20 must maintain a low temperature that is significantly lower than a temperature of the refrigerating compartment 10, the ice-making chamber 20 is isolated by a thermal insulation barrier rib 22. The thermal insulation barrier rib 22 is designed to entirely enclose the ice-making chamber 22 and thermal insulation material such as polyurethane or foam is filled in the thermal insulation barrier rib 22. That is, the thermal insulation barrier rib 22 is designed to sufficiently insulate the ice-making chamber 20 from the refrigerating compartment 10.

A separated vaporizer 32 is installed in the freezing compartment 20. The vaporizer 32 is configured to reduce a temperature of the ice-making chamber 20 to a level that can make ice by heat-exchanging with ambient air by refrigerant that is reduced in a temperature and pressure by a compressor 42 and a condenser (not shown).

A blower fan 34 that can uniformly transfer the cooled air generated by contacting

the vaporizer 32 into the ice-making chamber 20. The vaporizer 32 is not limited to a specific type. Any types of the vaporizer can be used as far as they can generate low temperature air through a heat exchange with ambient air. For example, the blower fan 34 may be omitted and a vaporizer to which a direct cooling method can be applied may be used.

An ice-making unit 24 that can make ice using the cool air generated by the vaporizer 32 is installed in the ice-making chamber 20. Any types of the ice-making unit, which can make the water stored in a tray frozen, may be used.

An ice storage unit 26 is installed under the ice-making unit 24. The ice storage unit 26 is provided to store the ice made by the ice-making unit 24. The transfer of the ice made in the ice-making unit to the ice storage unit 26 may be automatically or manually realized by the well-known prior arts. For use convenience, an automatic icemaker that can automatically transfer the ice made in the ice-making unit to the ice storage unit may be used.

An ice conveying unit (e.g., a screw-type wire that can convey the ice by rotating) for directing the ice stored in the ice storage unit 26 to an external side is installed in the ice storage unit 26. That is, the ice conveying unit is designed to rotate and convey the ice to an ice guide duct 36 communicating with the ice storage unit 26. The dispenser is installed on the front portion of the refrigerating compartment door 4 and the ice stored in the ice storage unit 26 is directed toward the dispenser 6 along the ice guide duct 36 by the ice conveying unit such as the screw-type wire.

In order to connecting an outer end of the ice guide duct 36 to the dispenser 6, it is formed on the refrigerating door 4. An inner end of the ice guide duct 36 is

connected to the ice storage unit 26 via the thermal insulation barrier rib 22 of the ice-making chamber 20.

An ice dispensing control unit for controlling the dispensing of the ice by selectively opening the ice guide duct 36 may be installed on the dispenser 6 installed on the front portion of the refrigerating compartment door 4. For example, the ice dispensing control unit 6 includes an operation lever installed at an outer side of the dispenser 6, a baffle for opening/closing the ice guide duce 36 in response to a user's manipulation of the operation lever. Any well-known structures may be used as the ice dispensing control unit.

A heat exchange chamber 50 is formed on an inner-rear portion of the freezing compartment 12. A vaporizer 52 and a blower fan 54 are installed in the heat exchange chamber 50. The vaporizer 52 generates cool air using low temperature/pressure liquid refrigerant supplied by a compressor 42 and a condenser (not shown). A part of the cool air generated around the vaporizer 52 is directly supplied to the freezing compartment 12 by the flower fan 54 and the rest is supplied to the refrigerating compartment through a cool air supply duct 56 connected to the refrigerating compartment 10 via a rear portion of a barrier 60.

The cool air supplied to the refrigerating compartment through the above-described path circulates the inside of the refrigerating compartment. Air that is increased in a temperature by heat-exchanging with the food stuffs stored in the refrigerating compartment is returned into the heat exchange chamber 50 through a recovery duct 58 installed on a rear wall of the barrier 60 or a rear side of the barrier 60. The supply of the cool air to the refrigerating compartment 10 is realized through the

above-described path and the cool air circulation along this path is repeated.

That is, a part of the cool air generated by the vaporizer installed in the heat exchange chamber 50 is directly supplied into the freezing chamber 12 by the blower fan 54 and the rest is supplied to the refrigerating compartment 10 through the cool air supply duct 56, thereby maintaining the refrigerating and freezing compartments 12 and 10 at a predetermine low temperature state.

According to the present invention, the refrigerating compartment 10 is designed to be opened and closed by the pair of doors 2 and 4 and the ice-making chamber 20 is formed in the refrigerating compartment 10. Additionally, the cool air supply is controlled by installing different vaporizers in the ice-making chamber 20 and the freezing compartment 12, respectively.

In the present invention, it can be noted that the ice-making chamber 20 is an independent space separated by the thermal insulation barrier rib 22. Therefore, various modifications of the thermal insulation barrier rib 22 may be possible as far as the modifications can form a separated, independent ice-making chamber in the refrigerating compartment.

Furthermore, it may be considered that the ice-making chamber 20 is separately prepared and detachably installed in the refrigerating compartment. That is, a box-shaped ice-making chamber may be made by a thermal insulation barrier rib and the chamber is detachably installed in the refrigerating compartment. In this case, the internal space of the refrigerating compartment 10 can be more efficiently utilized. In addition, when the ice-making chamber 20 is detachably installed, the ice-making unit and the vaporizer may be integrated with the ice-making chamber, and if required, the ice-making chamber 20 may be assembled in an assembling line.

This invention has been described above with reference to the aforementioned embodiments. It is evident, however, that many alternative modifications and variations will be apparent to those having skill in the art in light of the foregoing description. Accordingly, the present invention embraces all such alternative modifications and variations as fall within the spirit and scope of the appended claims.

[EFFECT OF THE INVENTION]

As described previously, a pair of doors are provided to open and close the refrigerating compartment 10 in which the ice-making chamber is installed. By providing the pair of doors, the cool air leakage caused by opening and closing the refrigerating compartment can be minimized. Additionally, widths of the drawer boxes installed in the refrigerating compartment 10 are designed to correspond to those of the corresponding doors 2 and 4, the user can take the drawer boxes by opening only the corresponding door. Furthermore, in the refrigerator of the present invention, even when the ice-making chamber is provided in the refrigerating compartment formed at the upper portion, the temperature of the freezing compartment does not affect the refrigerating compartment. Since the temperatures of the freezing compartment and the ice-making chamber are controlled by different vaporizers, the ice-making capability can be maxlmized and, at the same time, power consumption can be reduced.

WHAT IS CLAIMED IS:

1. A French door type refrigerator having a refrigerating compartment for storing foodstuff at a refrigerating temperature and a freezing compartment for storing foodstuff at a freezing temperature, the refrigerator comprising;

a pair of doors for opening and closing the refrigerating compartment,

wherein a width of at least one of the doors is greater than a width of a food storage unit installed in the refrigerating compartment so that the food storage unit can be taken out of the refrigerating compartment in a state where only one door is opened.

2. The French door type refrigerator according to claim 1, wherein an ice-making chamber that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and a vaporizer is installed in the ice-making chamber.

3. The French door type refrigerator according to one of claims 1 and 2, wherein gaskets are installed on opposing surfaces of the pair of doors so that they can contact each other in a state where the doors are closed.

4. The French door type refrigerator according to one of claims 1 and 2, further comprising:

a dispenser installed on a front portion of the door for opening and closing the refrigerating compartment;

an ice guide duct for guiding the ice from the ice-making chamber to the dispenser; and

an ice dispensing control unit for controlling dispensing of the ice through the ice guide duct.

5. The refrigerator according to one of claims 1 and 2, wherein the

refrigerating compartment is formed at an upper portion and the freezing compartment is formed at a lower portion.

6. The refrigerator according to claim 5, wherein a vaporizer for supplying cool air to the freezing and refrigerating compartments is installed in a heat exchange chamber disposed at a rear side of the freezing compartment, the heat exchange chamber communicates with the refrigerating compartment through the air guide duct, and the cool air is directed to the refrigerating compartment by a blower fan disposed in the heat exchange chamber.

7. The refrigerator according to claim 6, wherein the cool air supply duct is installed in rear of a barrier separating the refrigerating compartment from the freezing compartment.

8. The refrigerator according to claim 6, further comprising a recovery duct along which air circulating the refrigerating compartment is returned to the heat exchange chamber and which is installed at a rear side of the barrier separating the refrigerating compartment from the freezing compartment.

Fig.1

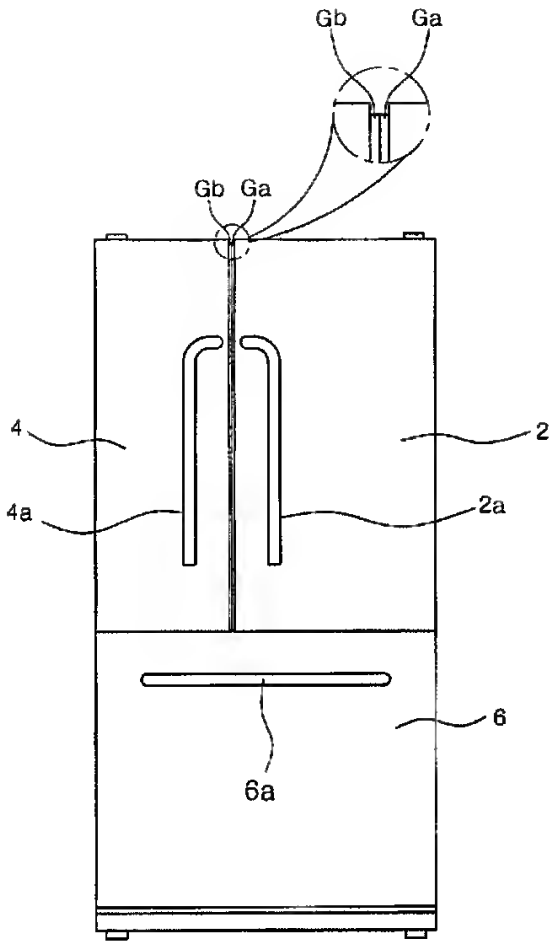


Fig.2

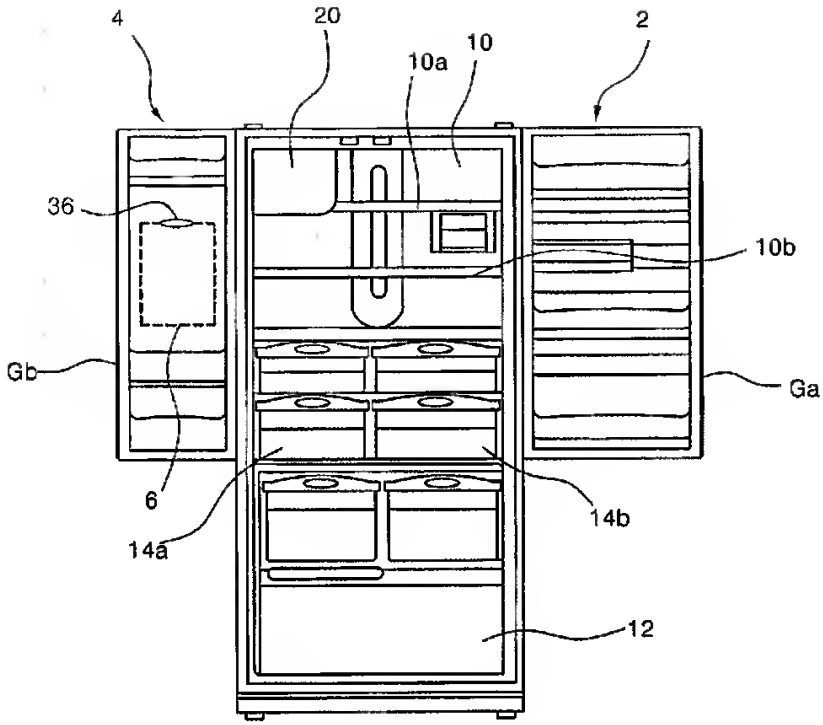
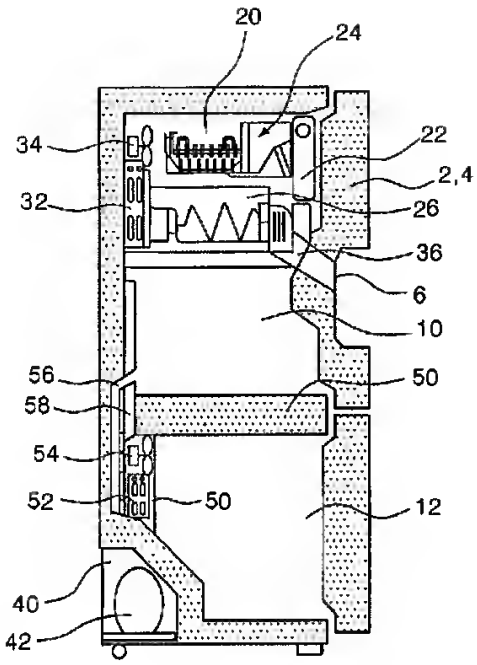


Fig.3



[ABSTRACT]

Disclosed is a refrigerator having a refrigerating compartment 10 formed at an upper portion and a freezing compartment 12 formed at a lower portion. An ice-making chamber 20 is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit. A dispenser 6 is installed on a front portion of the door of the refrigerating compartment 1-. Water is supplied from a water source to a filter 50 via a supply pipe P1 and further supplied from the filter 50 to the ice-making chamber 20 and the water supply tank 52 along respective supply pipes P2 and P3. The water is supplied from the water supply tank 52 to the dispenser along a supply pipe P4. The supply pipes are installed on the refrigerating compartment, thereby making the water supply structure.\

[REPRESENTATIVE DRAWING]

FIG. 2

[INDEX WORD]

Refrigerator, Ice-making unit, Dispenser, Water supply

[SPECIFICATION]

[TITLE OF THE INVENTION]

REFRIGERATOR

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a view of a conventional refrigerator;

Fig. 2 is a view of a refrigerator according to a first embodiment of the present invention;

Fig. 3 is a view of a refrigerator according to a second embodiment of the present invention; and

Fig. 4 is a view of an ice-making chamber of a refrigerant compartment of a refrigerator according to an embodiment of the present invention.

<DESCRIPTION OF THE SYMBOLS IN MAIN PORTIONS OF THE DRAWINGS>

2, 4: Refrigerating compartment door	6: Freezing compartment door
10: Refrigerating compartment	12: Freezing compartment
20: Ice-making chamber	22: Thermal insulation barrier rib
24: Ice-making unit	26: Ice storage unit
32: Vaporizer	34: Blower fan
40: Machine room	42: Compressor
52: Vaporizer	54: Blower fan

P1, P2, P3, P4, P11, P12, P13, P14: Supplying pipe

V1, V2, V3, V11, V12, V13: Valve

[DETAILED DESCRIPTION OF THE PRESENT INVENTION]

[OBJECT OF THE PRESENT INVENTION]

[FIELD OF THE INVENTION AND DESCRIPTION OF THE RELATED ART]

The present invention relates to a refrigerator, and more specifically, to a refrigerator having an effective fluid passage structure to an ice-making unit and a dispenser.

Generally, a refrigerator has a freezing compartment formed at an upper portion and a refrigerating compartment formed at a lower portion. In a side-by-side refrigerator, the freezing compartment is formed at a left side and the refrigerating chamber formed at a right side.

Recently, refrigerators having an icemaker for making and storing ice have been on the market. The ice made by the icemaker is stored in an ice storage unit and is dispensed through a dispenser installed on a front portion of a door of the refrigerator when a user wishes to use the Ice.

That is, as shown in Fig. 1, in the side-by-side refrigerator, a freezing compartment is formed at a left side and an ice-making unit 72 is installed in the freezing compartment. A dispenser 74 for dispensing water or ice is installed on a front portion of the freezing compartment door 82.

The supply of the water from a water source is controlled by a value Va. When the value is opened, the water is supplied to a filter 76 along a supply pipe Pe. The water passing through the filter 76 is directed to a valve Vb along a supply pipe Pb and subsequently to a water tank 78 along a supply pipe Pc. The water is directed from the water tank 78 to the dispenser 78 along a supply pipe Pe. The supply pipe Pe extends from a main body of the refrigerator into the freezing compartment door 82 through a lower hinge 84 of the freezing compartment door 82.

The supply pipe Pb is connected to the supply pipe Pd via a valve Vc installed at a downstream side. The supply pipe Pd is provided to supply water that will be used for the ice made by the ice-making unit.

According to the typical refrigerator, since the supply pipe must be installed the refrigerating compartment into the freezing compartment via the freezing compartment door. Therefore, the supply pipes are complicatedly arranged along the refrigerating compartment and the freezing compartment. Thus, an overall length hoses forming the supply pipe is lengthened and the cost increases. In addition, due to the complicated pipe structure, the pipes may be easily damaged.

Additionally, since a temperature of the water supplied to the ice-making unit is low, the water may be frozen at the hose. When a supply pipe heater is used to prevent the freezing of the water at the hose, the overall product cost as well as the power consumption increase. The supply pipes arranged from the water supply tank 78 to the dispenser 74 must be designed to pass through an outer side of the door, some problems may occur when high temperature water is initially dispensed from the dispenser 74.

Furthermore, the ice-making unit is generally installed in the freezing compartment where a low temperature capable of making the ice can be maintained. When the ice-making unit is installed in the freezing compartment, A lot of design limitations may occur in accordance with the location of the freezing compartment. For example, in a combination type refrigerator where the freezing compartment is formed at an upper portion and the refrigerating compartment is formed at a lower portion, it is very difficult to install the ice-making unit. Furthermore, it is very inconvenient to dispense the ice through the dispenser from at the front of the refreezing compartment.

When the ice-making unit is installed in the refrigerating compartment, it is difficult to adjust the temperature of the refrigerating compartment or the ice-making capability may be significantly deteriorated.

[TECHNICAL OBJECT OF THE INVENTION]

The present invention has been made in an effort to solve the above-described problems and it is an object of the present invention to provide a refrigerator having an ice-making unit and a dispenser, which can minimize a water supply structure.

[CONSTITUTION AND OPERATION OF THE INVENTION]

To achieve the above objects and other advantages, the present invention provides a refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator including: an ice-making chamber that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit; a refrigerating compartment door, on a front portion of which a dispenser is installed, for opening and closing the refrigerating compartment; a water supply tank for supplying water to the dispenser; an ice-making water supply unit for supplying the water from a water source to the ice-making chamber; and a dispenser water supply unit for supplying the water from the water source to the dispenser via water supply tank.

In another aspect, the present invention provides a refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator including: an ice-making chamber that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit; a refrigerating compartment door, on a front portion of which a dispenser is installed and on a rear portion of which a water supply tank is installed; an ice-making water supply unit for supplying the water from a water source to the ice-making chamber; and a dispenser water supply unit for supplying the water from the water source to the dispenser via water supply tank.

In one embodiment, the water supply tank may be installed on an inner surface of the refrigerating compartment door.

In one embodiment, the water supply unit includes a supply pipe for directing the water from the water source to a filter; a supply pipe for directing the water from the filter to the ice-making chamber; a supply pipe for directing the water from the filter to the water supply tank; and a supply pipe for directing the water from the water supply tank to the dispenser.

In one embodiment, the ice-making chamber includes a vaporizer for generating cool air; an ice-making unit for freezing the water using the cool air generated by the vaporizer; an ice storage unit for storing ice transferred from the ice-making unit; and a conveying unit for conveying the ice from the ice storage unit to the dispenser.

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown.

Reference will now be made in detail to the embodiments of the present disclosure, example of which are illustrated in the accompanying drawings.

Fig. 1 is a front view of a refrigerator according to a first embodiment of the present invention, when a refrigerator door is opened, Fig. 2 is a front view of a refrigerator according to a second embodiment, when a refrigerator door is opened, and Fig. 3 is a sectional view of a refrigerator according to the present invention.

The following will describe a first embodiment of the present invention with reference to Fig. 1. As shown in Fig. 1, a refrigerator of the present invention has a refrigerating compartment 10 formed at an upper portion and a freezing compartment formed at a lower portion. The refrigerating and freezing compartments 10 and 12 are opened and closed by doors 2 and 4. That is, as shown in Fig. 1, a pair of doors 2 and

4 are installed on hinges (not shown) that are formed upper and lower portions of respective both side ends and opened leftward and rightward with reference to left and right ends, respectively.

When the pair of the doors 2 and 4 are provided to open and close the refrigerating compartment 10, the following advantages can be obtained. In response to tendency of large capacity refrigerators, the internal volume of the refrigerating compartment has been increased. Further, since an ice-making chamber 20 (see Figs. 2 and 3) must be installed in the refrigerating compartment 10 according to the present invention, it is preferable that the refrigerating compartment 10 is designed to have a large capacity to obtain a sufficient refrigerating space. When the refrigerating compartment is large-sized s described above, it is preferable to install a pair of doors 2 and 4. That is, the cool air leaks out of the refrigerating compartment when the door is opened and closed. Therefore, when only one door is installed, the cool air leakage increases. When the pair of doors 2 and 4 are provided, the cool air leakage can be relatively minimized by opening and closing only one of the doors 2 and 4. Additionally, a sufficient space in front of the refrigerator must be provided to open and close the door. When only one large-sized door is provided, the space in front of the refrigerant must increase and it is inconvenient to open and close the large-sized door. Accordingly, when the pair of doors 2 and 4 are provided to be opened and closed leftward and rightward with reference to the both side ends, respectively, it is more convenient to open and close the door and the space in front of the refrigerator can be more efficiently used.

The freezing compartment 12 installed at the lower portion of the refrigerator can

be opened and closed by doors. At this point, the freezing compartment 12 may be opened and closed by, for example, drawer type doors. In this case, the door is pulled frontward to be opened. In this state, the user can easily find desired foodstuff. Handles are installed on respective front portions of the doors. The user graphs the handle to open and close the corresponding door.

The ice-making chamber 20 is installed in a portion of the refrigerating compartment 10. The dispenser 6 through which the ice from the ice-making chamber 20 and the water from the refrigerator can be dispensed is installed on the refrigerating compartment door 4.

The following will describe a water supply structure to the refrigerator of the present invention.

The water is directed from the water source into the refrigerator along a supply pipe P1 and then to a filter 50. A valve V1 for controlling general water supply is installed on the supply pipe P1.

The water is then supplied from the filter 50 to the ice-making chamber 20 along a supply pipe P2. A valve 2 for controlling water supply to the ice-making chamber 20 is installed on the supply pipe P2.

The water is further directed from the filter 50 to a water supply tank 52 along a supply pipe P3 and a valve V3 for controlling water supply is installed on the supply pipe P3. The water supply tank 52 maintains a predetermined amount of water at a predetermined low temperature and supplies the water to the dispenser.

The water supply tank 52 is connected to the dispenser 6 via a supply pipe P4. The supply pipe P4 is installed penetrating a lower hinge of the refrigerating

compartment door 4 and substantially functions to connect the water supply tank 52 to the dispenser 6. In this embodiment, the water supply tank 52 is installed at a side of the inside of the refrigerating compartment 10 and extends directly from the water supply tank 52 to the refrigerating compartment door 4. Therefore, the water dispensed from the dispenser 6 can maintain a refrigerating temperature.

According to the refrigerator of the present invention, it can be noted that the supply pipes fro supplying the water from the water source to the ice-making chamber 20 and the dispenser 6 are substantially installed inside the refrigerating compartment 10. Therefore, the arrangement of the supply pipes is simpler than the prior art where the pipes are arranged via both the refrigerating and freezing compartments.

In order to avoid the appearance of the supply pipes to an external side, the supply pipes may be buried on a surface an inner case defining the refrigerating compartment or in a thermal insulation material of a wall defining the refrigerating compartment. The arrangement of the supply pipes are same as in a second embodiment that will be described later.

The following will describe a second embodiment of the present invention with reference to Fig. 3. This embodiment is different from the foregoing embodiment in that a water supply tank 52 is installed on an inside of a refrigerating compartment door 4 where a dispenser 6 Is installed. As shown in Fig. 3, water is directed into the refrigerator along a supply pipe P11 and subsequently to a filter 50. A valve V11 for controlling general water supply is installed on the supply pipe P11.

The water is directed from the filter 50 to an ice-making chamber 20 along a supply pipe P12. A value V12 for controlling water supply to the ice-making chamber

20 is installed on the supply pipe P12.

The water is further directed from the filter 50 to the water supply tank 52 along a supply pipe P13 branched off from the supply pipe P12. A valve V13 for controlling water supply is installed on the supply pipe P13. The water supply tank 52 functions to supply the water to the dispenser 6 while maintaining the water at a refrigerating temperature.

In this embodiment, the water supply tank 52 is installed on the refrigerating compartment door 4. The supply pipe P13 is installed penetrating an upper hinge of the refrigerating compartment door 4 to supply the water to the water supply tank 52.

The water supply tank 52 installed on the refrigerating door 4 is connected to the dispenser 6 via a supply pipe P14. In this embodiment, since the water supply tank 52 is installed on a portion of the refrigerating compartment door 4, which is exposed to the inside of the refrigerating compartment 10, the water dispensed through the dispenser 6 can maintain the refrigerating temperature.

As described above, it can be noted that the water supply tank 52 is installed on a portion of the refrigerating compartment door 4, which faces the inside of the refrigerating compartment 10. In the refrigerator of this embodiment, the supply pipes for supplying the water from the water source to the ice-making chamber 20 and the dispenser 6 are substantially installed only inside the refrigerating compartment 10.

The following will describe a structure of the ice-making chamber 20 installed in the refrigerating compartment 10 with reference to Fig. 4.

As described above, the ice-making chamber 20 is formed at a side of an upper portion of the refrigerating compartment 10. Since the ice-making chamber 20 must

maintain a low temperature that is significantly lower than a temperature of the refrigerating compartment 10, the ice-making chamber 20 is isolated by a thermal insulation barrier rib 22. The thermal insulation barrier rib 22 is designed to entirely enclose the ice-making chamber 22 and thermal insulation material such as polyurethane or foam is filled in the thermal insulation barrier rib 22. That is, the thermal insulation barrier rib 22 is designed to sufficiently insulate the ice-making chamber 20 from the refrigerating compartment 10.

A separated vaporizer 32 is installed in the freezing compartment 20. The vaporizer 32 is configured to reduce a temperature of the ice-making chamber 20 to a level that can make ice by heat-exchanging with ambient air by refrigerant that is reduced in a temperature and pressure by a compressor 42 and a condenser (not shown).

A blower fan 34 that can uniformly transfer the cooled air generated by contacting the vaporizer 32 into the ice-making chamber 20. The vaporizer 32 is not limited to a specific type. Any types of the vaporizer can be used as far as they can generate low temperature air through a heat exchange with ambient air. For example, the blower fan 34 may be omitted and a vaporizer to which a direct cooling method can be applied may be used.

An ice-making unit 24 that can make ice using the cool air generated by the vaporizer 32 is installed in the ice-making chamber 20. Any types of the ice-making unit, which can make the water stored in a tray frozen, may be used.

An ice storage unit 26 is installed under the ice-making unit 24. The ice storage unit 26 is provided to store the ice made by the ice-making unit 24. The transfer of the

ice made in the ice-making unit to the ice storage unit 26 may be automatically or manually realized by the well-known prior arts. For use convenience, an automatic icemaker that can automatically transfer the ice made in the ice-making unit to the ice storage unit may be used.

An ice conveying unit (e.g., a screw-type wire that can convey the ice by rotating) for directing the ice stored in the ice storage unit 26 to an external side is installed in the ice storage unit 26. That is, the ice conveying unit is designed to rotate and convey the ice to an ice guide duct 36 communicating with the ice storage unit 26. The dispenser is installed on the front portion of the refrigerating compartment door 4 and the ice stored in the ice storage unit 26 is directed toward the dispenser 6 along the ice guide duct 36 by the ice conveying unit such as the screw-type wire.

In order to connecting an outer end of the ice guide duct 36 to the dispenser 6, it is formed on the refrigerating door 4. An inner end of the ice guide duct 36 is connected to the ice storage unit 26 via the thermal insulation barrier rib 22 of the ice-making chamber 20.

An ice dispensing control unit for controlling the dispensing of the ice by selectively opening the ice guide duct 36 may be installed on the dispenser 6 installed on the front portion of the refrigerating compartment door 4. For example, the ice dispensing control unit 6 includes an operation lever installed at an outer side of the dispenser 6, a baffle for opening/closing the ice guide duce 36 in response to a user's manipulation of the operation lever. Any well-known structures may be used as the ice dispensing control unit.

A heat exchange chamber 50 is formed on an inner-rear portion of the freezing

compartment 12. A vaporizer 52 and a blower fan 54 are installed in the heat exchange chamber 50. The vaporizer 52 generates cool air using low temperature/pressure liquid refrigerant supplied by a compressor 42 and a condenser (not shown). A part of the cool air generated around the vaporizer 52 is directly supplied to the freezing compartment 12 by the flower fan 54 and the rest is supplied to the refrigerating compartment through a cool air supply duct 56 connected to the refrigerating compartment 10 via a rear portion of a barrier 60.

The cool air supplied to the refrigerating compartment through the above-described path circulates the inside of the refrigerating compartment. Air that is increased In a temperature by heat-exchanging with the food stuffs stored in the refrigerating compartment is returned into the heat exchange chamber 50 through a recovery duct 58 installed on a rear wall of the barrier 60 or a rear side of the barrier 60. The supply of the cool air to the refrigerating compartment 10 is realized through the above-described path and the cool air circulation along this path is repeated.

That Is, a part of the cool air generated by the vaporizer installed in the heat exchange chamber 50 is directly supplied into the freezing chamber 12 by the blower fan 54 and the rest is supplied to the refrigerating compartment 10 through the cool air supply duct 56, thereby maintaining the refrigerating and freezing compartments 12 and 10 at a predetermine low temperature state.

According to the present invention, the refrigerating compartment 10 is designed to be opened and closed by the pair of doors 2 and 4 and the ice-making chamber 20 is formed in the refrigerating compartment 10. Additionally, the cool air supply is controlled by installing different vaporizers in the ice-making chamber 20 and the

freezing compartment 12, respectively.

In the present invention, it can be noted that the ice-making chamber 20 is an independent space separated by the thermal insulation barrier rib 22. Therefore, various modifications of the thermal insulation barrier rib 22 may be possible as far as the modifications can form a separated, independent ice-making chamber in the refrigerating compartment.

Furthermore, it may be considered that the ice-making chamber 20 is separately prepared and detachably installed in the refrigerating compartment. That is, a box-shaped ice-making chamber may be made by a thermal insulation barrier rib and the chamber is detachably installed in the refrigerating compartment. In this case, the internal space of the refrigerating compartment 10 can be more efficiently utilized. In addition, when the ice-making chamber 20 is detachably installed, the ice-making unit and the vaporizer may be integrated with the ice-making chamber, and if required, the ice-making chamber 20 may be assembled in an assembling line.

This invention has been described above with reference to the aforementioned embodiments. It is evident, however, that many alternative modifications and variations will be apparent to those having skill in the art in light of the foregoing description. Accordingly, the present invention embraces all such alternative modifications and variations as fall within the spirit and scope of the appended claims.

[EFFECT OF THE INVENTION]

As described previously, all the supply pipes for supplying the water to the ice-making chamber 20 and the dispenser 6 are designed to pass through only the refrigerating compartment 10. Therefore, the overall structure is further simplified and thus the assembling process is convenient and the damage of the supply pipes can be prevented. Additionally, the water dispensed from the water supply tank, which is installed on an inner surface of the refrigerating compartment door or in the refrigerating compartment through the dispenser can always maintained at a refrigerating temperature. Further, since the water supply pipes are arranged not to pass through the freezing compartment, the problems caused by the freezing of the water can be solved.

Furthermore, in the refrigerator of the present invention, even when the ice-making chamber is provided in the refrigerating compartment formed at the upper portion, the temperature of the freezing compartment does not affect the refrigerating compartment. Since the temperatures of the freezing compartment and the ice-making chamber are controlled by different vaporizers, the ice-making capability can be maximized and, at the same time, power consumption can be reduced.

WHAT IS CLAIMED IS:

1. A refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator comprising:

an ice-making chamber that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit;

a refrigerating compartment door, on a front portion of which a dispenser is installed, for opening and closing the refrigerating compartment;

a water supply tank for supplying water to the dispenser;

an ice-making water supply unit for supplying the water from a water source to the ice-making chamber; and

a dispenser water supply unit for supplying the water from the water source to the dispenser via water supply tank.

2. A refrigerator having a refrigerating compartment formed at an upper portion and a freezing compartment formed at a lower portion, the refrigerator comprising:

an ice-making chamber that is provided as a separate space in the refrigerating compartment by a thermal insulation barrier rib and has an ice-making unit for making ice and an ice storage unit for storing ice made by the ice-making unit;

a refrigerating compartment door, on a front portion of which a dispenser is installed and on a rear portion of which a water supply tank is installed;

an ice-making water supply unit for supplying the water from a water source to the ice-making chamber; and

a dispenser water supply unit for supplying the water from the water source to the dispenser via water supply tank.

3. The refrigerator according to one of claims 1 and 2, wherein the water supply unit comprises:

a supply pipe P1, P11 for directing the water from the water source to a filter 50;

a supply pipe P2, P12 for directing the water from the filter to the ice-making chamber;

a supply pipe P3, P13 for directing the water from the filter to the water supply tank; and

a supply pipe P4, P14 for directing the water from the water supply tank to the dispenser.

4. The refrigerator according to one of claims 1 and 2, wherein the ice-making chamber comprises:

a vaporizer for generating cool air;

an ice-making unit for freezing the water using the cool air generated by the vaporizer;

an ice storage unit for storing ice transferred from the ice-making unit; and

a conveying unit for conveying the ice from the ice storage unit to the dispenser.

5. The refrigerator according to one of claims 1 and 2, wherein the refrigerating door is a drawer type door.

6. The refrigerator according to one of claims 1 and 2, wherein a valve for controlling water supply is installed on each of the supply pipes.

Fig.1

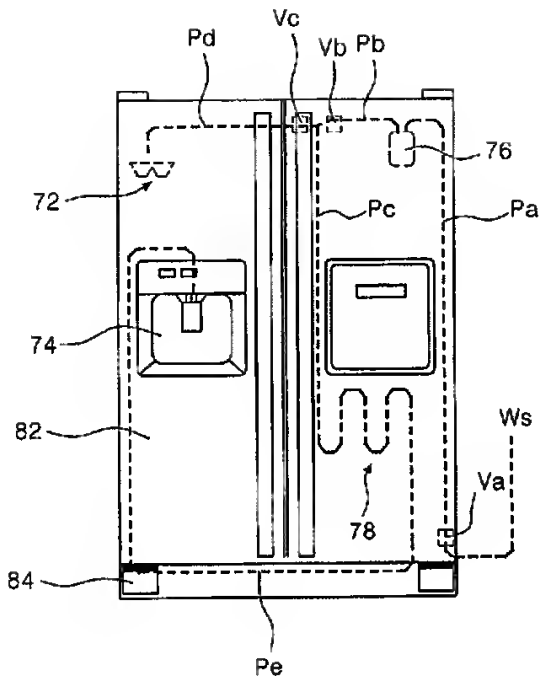


Fig.2

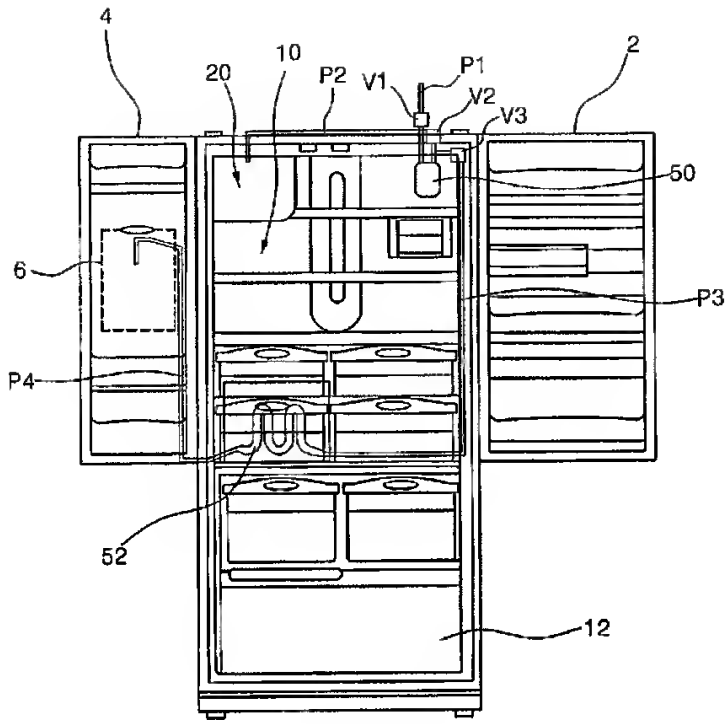


Fig.3

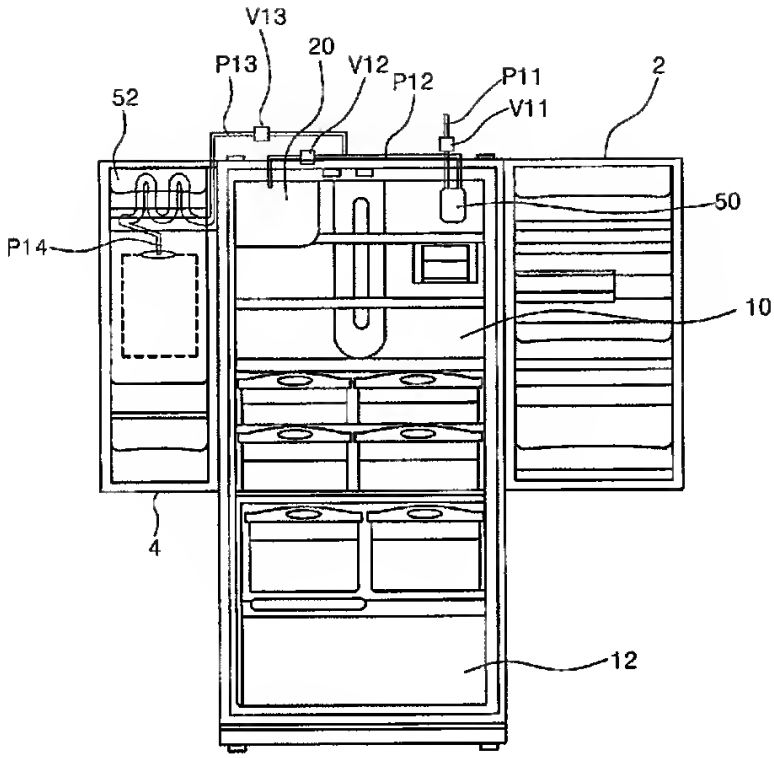


Fig.4